

24/08/2022



RM-G2  
CODE-B

**Corporate Office :** Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

MM : 720

## FORTNIGHTLY TEST SERIES

Time : 3 hrs. 20 min

(for NEET-2023)

### Test - 2

#### Topics covered :

**Physics** : Motion in a Plane, Laws of Motion

**Chemistry** : Structure of Atom, Classification of Elements and Periodicity in Properties

**Botany** : Cell Cycle and Cell Division, The Living World

**Zoology** : Biomolecules

#### Instructions :

- (i) There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
- (ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.
- (iii) Use blue/black ballpoint pen only to darken the appropriate circle.
- (iv) Mark should be dark and completely fill the circle.
- (v) Dark only one circle for each entry.
- (vi) Dark the circle in the space provided only.
- (vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.



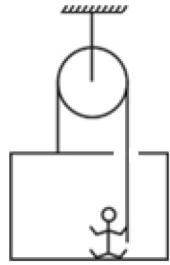
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## PHYSICS

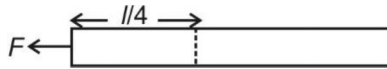
Choose the correct answer:

### SECTION-A

1. Choose the correct statement(s) from the following.
  - (1)  $\vec{A} + \vec{B}$  is equal to  $\vec{B} + \vec{A}$
  - (2) A vector added with its negative vector results into null vector
  - (3) A unit vector does not have any unit
  - (4) All of these
2. Given that  $\vec{A} + \vec{B} + \vec{C} = 0$ . Out of three vectors two are equal in magnitude and magnitude of third vector is  $\sqrt{2}$  times that of either of two having equal magnitude. Then angle between vectors are given by
  - (1)  $90^\circ, 135^\circ, 135^\circ$
  - (2)  $90^\circ, 45^\circ, 45^\circ$
  - (3)  $90^\circ, 135^\circ, 45^\circ$
  - (4)  $90^\circ, 60^\circ, 30^\circ$
3. If a unit vector is represented by  $0.5\hat{i} + 0.5\hat{j} + c\hat{k}$ , then the value of  $c$  is approximately
  - (1) 0.70
  - (2) 0.20
  - (3) 0.50
  - (4) 0.25
4. If a vector  $\vec{p}$  is making angles  $\alpha, \beta$  and  $\gamma$  respectively with  $x, y$  and  $z$  axes-respectively, then  $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma$  is equal to
  - (1) 0
  - (2) 1
  - (3) 2
  - (4) 3
5. The speed of the boat is 5 km/h in still water. It crosses a river of width 1 km along the shortest possible path in 15 min. Then velocity of river will be
  - (1) 45 km/h
  - (2) 4 km/h
  - (3) 3 km/h
  - (4) 15 km/h
6. A man moves on a horizontal road towards east at a speed of 1 km/h and the rain appears to him falling vertically at a speed of 2 km/h. The actual speed of the rain is
  - (1)  $\sqrt{3}$  km/h
  - (2)  $\sqrt{2}$  km/h
  - (3)  $\sqrt{5}$  km/h
  - (4)  $\sqrt{10}$  km/h
7. For a particle  $x$  and  $y$  coordinates varies with time as,  $x = 6t$ ,  $y = 8t - 5t^2$ . The initial speed of projection is ( $x$  and  $y$  are in meter and  $t$  in second)
  - (1) 10 m/s
  - (2) 100 m/s
  - (3) 20 m/s
  - (4)  $\sqrt{10}$  m/s
8. The equation of motion of a projectile is  $y = 12x - \frac{3}{4}x^2$ . What is the range of projectile? ( $y$  and  $x$  are in meter)
  - (1) 12 m
  - (2) 8 m
  - (3) 48 m
  - (4) 16 m
9. A projectile is projected with a speed 30 m/s at an angle  $60^\circ$  with the horizontal. The speed of projectile when its direction of motion makes an angle  $30^\circ$  with the horizontal is
  - (1)  $10\sqrt{3}$  m/s
  - (2)  $5\sqrt{3}$  m/s
  - (3)  $\sqrt{3}$  m/s
  - (4) 30 m/s
10. A projectile is projected from ground at an angle  $45^\circ$  with horizontal, if range of projectile is  $R$ , then the maximum height attained is
  - (1)  $\frac{R}{4}$
  - (2)  $\frac{R}{2}$
  - (3)  $\frac{R}{8}$
  - (4)  $\frac{R}{6}$
11. A ball is projected with a velocity  $20\sqrt{3}$  m/s at an angle  $60^\circ$  with the horizontal. The time interval after which the velocity vector will make an angle  $30^\circ$  with the horizontal is ( $g = 10 \text{ m/s}^2$ )
  - (1) 3 second
  - (2) 2 second
  - (3) 1 second
  - (4) 0.5 second
12. A body of mass 2 kg is placed on smooth horizontal plane, if it is pulled by the horizontal force of 2 N then the velocity of the body after 3 s is
  - (1) 1 m/s
  - (2) 2 m/s
  - (3) 3 m/s
  - (4) 4 m/s
13. A football at rest gets linear momentum of  $3 \text{ kg m s}^{-1}$  in 0.6 s of time interval, when it is hit by a footballer. The force acted on the football during this interval is
  - (1) 3 N
  - (2) 4 N
  - (3) 5 N
  - (4) 6 N

14. Two stones are thrown with same speed  $u$  but at different angles from ground in air. If both stones have same horizontal range and height attained by them are  $h_1$  and  $h_2$ , then  $h_1 + h_2$  is equal to
- (1)  $\frac{u^2}{4g}$  (2)  $\frac{u^2}{3g}$   
 (3)  $\frac{u^2}{2g}$  (4)  $\frac{u^2}{g}$
15. A body is projected with a speed 25 m/s at an angle  $\theta$  with vertical. The kinetic energy at the highest point is  $\frac{3}{4}$ th of the initial kinetic energy. The value of  $\theta$  is
- (1)  $60^\circ$  (2)  $30^\circ$   
 (3)  $45^\circ$  (4) Less than  $45^\circ$
16. A ball rolls from the top of a stairway with a horizontal velocity  $u$ . If the steps are  $h$  m high and  $b$  m wide, the ball will hit the edge of the  $n^{\text{th}}$  step if
- (1)  $n = \frac{2hu^2}{gb^2}$  (2)  $n = \frac{hu^2}{gb^2}$   
 (3)  $n = \frac{hu^2}{2gb^2}$  (4)  $n = \frac{2hu^2}{bg^2}$
17. A particle is revolving in a circular path of radius 10 m with constant angular speed 20 rev/min. The angular acceleration of particle is
- (1)  $\pi^2$  (2)  $3\pi^2$   
 (3)  $5\pi^2$  (4) Zero
18. A bullet of mass 10 g is fired from the gun of mass 450 g. If the velocity of bullet is 90 m/s, then the recoil velocity of gun is
- (1) 2 m/s (2) 4 m/s  
 (3) 8 m/s (4) 10 m/s
19. A particle moves such that its position vector is given by  $\vec{r} = \cos \omega t \hat{i} + \sin \omega t \hat{j}$ , where  $\omega$  is a constant. Which of the following statement is true?
- (1) Velocity and acceleration both are parallel to  $\vec{r}$   
 (2) Velocity is parallel and acceleration is perpendicular to  $\vec{r}$   
 (3) Velocity is perpendicular and acceleration is parallel to  $\vec{r}$   
 (4) Velocity is perpendicular and acceleration is antiparallel to  $\vec{r}$
20. A particle has initial velocity  $2\hat{i} + 3\hat{j}$  and acceleration  $(\hat{i} + \hat{j})$ . The magnitude of velocity of the particle after 10 s will be
- (1)  $\sqrt{313}$  units (2)  $\sqrt{300}$  units  
 (3)  $\sqrt{169}$  units (4)  $\sqrt{144}$  units
21. The angular speed of earth around its own axis is
- (1)  $\frac{\pi}{1800}$  rad/s (2)  $\frac{\pi}{3600}$  rad/s  
 (3)  $\frac{\pi}{6400}$  rad/s (4)  $\frac{\pi}{43200}$  rad/s
22. A particle of mass 2 kg is increasing its velocity as,  $v = 4t\hat{i}$  m s $^{-1}$  where  $t$  = time in seconds. Its linear momentum at an instant will be
- (1)  $(4t\hat{j})$  kg m s $^{-1}$  (2)  $(8t\hat{k})$  kg m s $^{-1}$   
 (3)  $(4t\hat{i} + 4t\hat{j})$  kg m s $^{-1}$  (4)  $(8t\hat{i})$  kg m s $^{-1}$
23. A man of mass 50 kg stands inside a box of mass 30 kg as shown in the figure. For the system to be in equilibrium, what force man must exert on the rope?
- 
- (1) 400 N  
 (2) 600 N  
 (3) 300 N  
 (4) 1000 N
24. A monkey is descending from the branch of a tree with a constant acceleration. If the breaking strength of the branch is 75% of the weight of the monkey, then minimum acceleration with which the monkey can slide down without breaking the branch is
- (1)  $\frac{g}{4}$  (2)  $\frac{g}{2}$   
 (3)  $\frac{3g}{4}$  (4)  $g$

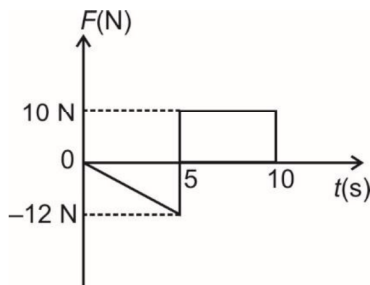
25. A force  $F$  is applied at the left end of a uniform rod of mass  $m$  and length  $l$  placed on smooth horizontal surface as shown in figure. The tension in the rod at a distance  $\frac{l}{4}$  from left end is



- (1)  $F/2$  (2)  $2F/5$   
 (3)  $3F/2$  (4)  $3F/4$
26. Position of a particle of mass 1 kg varies according to the equation  $x(t) = (20 \text{ m/s})t + (30 \text{ m/s}^2)t^2$  (where  $t$  is in second). The force acting on the body at time  $t = 1 \text{ s}$  is
- (1) 300 N (2) 60 N  
 (3) 400 N (4) 600 N
27. A particle of mass  $m = 1 \text{ kg}$  is tied to a string and a horizontal force  $F = 20 \text{ N}$  is applied on the particle as shown in figure. If particle is in equilibrium, then tension in the string is ( $g = 10 \text{ m/s}^2$ )

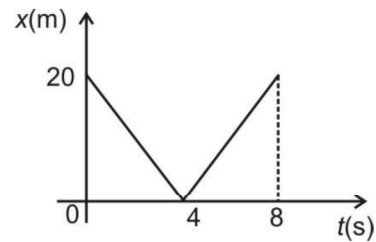


- (1)  $5\sqrt{30} \text{ N}$  (2)  $5\sqrt{10} \text{ N}$   
 (3)  $5\sqrt{20} \text{ N}$  (4)  $3\sqrt{20} \text{ N}$
28. The graph of force ( $F$ ) versus time ( $t$ ) for a body of mass 2 kg is shown in figure. The change in momentum of the body between  $t = 0$  to  $t = 10 \text{ s}$  is

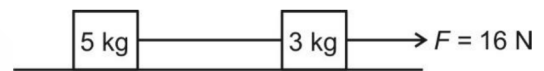


- (1) 20 N s  
 (2) 40 N s  
 (3) 80 N s  
 (4) 70 N s

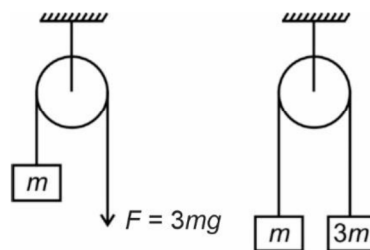
29. The position ( $x$ ) - time ( $t$ ) graph for a particle of mass 1 kg along  $x$ -axis is shown in figure. Find impulse on particle at  $t = 4 \text{ s}$ .



- (1) 5 N s (2) 10 N s  
 (3) 50 N s (4) Zero
30. What is the acceleration of 5 kg mass?

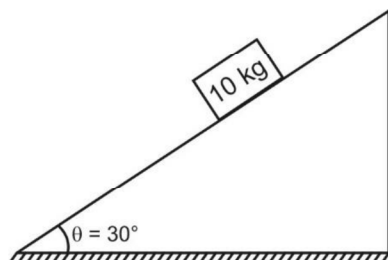


- (1)  $2 \text{ m/s}^2$   
 (2)  $4 \text{ m/s}^2$   
 (3)  $1 \text{ m/s}^2$   
 (4)  $3 \text{ m/s}^2$
31. An explosion breaks a stone into three parts. Two of them go off at right angle to each other, the first part of mass 1 kg moves with a speed of  $12 \text{ m/s}$  and the second part of mass 2 kg moves with  $8 \text{ m/s}$  speed. If the third part of mass 5 kg flies off with speed  $v$ , then  $v$  is
- (1) 2 m/s (2)  $4 \text{ m/s}^{-1}$   
 (3) 6 m/s (4)  $8 \text{ m/s}^{-1}$
32. In the arrangement shown in two figures, the mass  $m$  will ascend with acceleration respectively



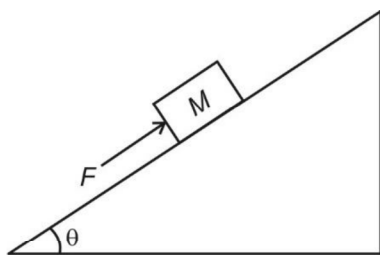
- (1)  $\frac{g}{2}, \frac{g}{2}$   
 (2)  $g, \frac{g}{2}$   
 (3)  $3g, \frac{g}{2}$   
 (4)  $2g, \frac{g}{2}$

33. A block of mass 10 kg is kept on a fixed inclined plane of  $\mu = 0.8$ . The frictional force acting on the block is ( $g = 10 \text{ ms}^{-2}$ )



- (1) 50 N (2) 60 N  
(3)  $40\sqrt{3}$  N (4)  $50\sqrt{3}$  N

34. A block of mass  $M$  is placed on a rough inclined plane. A force  $F$  is applied parallel to the inclined as shown in the figure, such that block just starts moving upwards. The value of  $F$  is



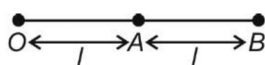
- (1)  $Mg \sin \theta - \mu Mg \cos \theta$   
(2)  $Mg \sin \theta + \mu Mg \cos \theta$   
(3)  $Mg \sin \theta$   
(4)  $\mu Mg \cos \theta$

35. The coefficient of static friction between a block and an inclined plane is  $\sqrt{3}$ . The angle of repose will be

- (1)  $30^\circ$  (2)  $60^\circ$   
(3)  $45^\circ$  (4)  $53^\circ$

### SECTION-B

36. Two identical particles are joined together by a thread as shown in figure. Both particles are moving in a circular path about O in a horizontal plane. If the velocity of the outermost particle B is  $v_0$ , then ratio of linear speed of A and B is



- (1) 1 : 2 (2) 1 : 3  
(3) 2 : 3 (4) 3 : 5

37. A particle of mass  $m$  is executing uniform circular motion on a path of radius  $r$ . If  $p$  is the magnitude of its linear momentum, the radial force acting on the particle is

- (1)  $\frac{p^2}{rm}$  (2)  $\frac{rm}{p}$   
(3)  $\frac{mp^2}{r}$  (4)  $pmr$

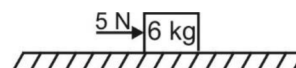
38. A motorcyclist moving with a velocity of 72 km/h on a flat road takes a turn on the road at a point where the radius of curvature of the road is 20 m. The acceleration due to gravity is  $10 \text{ m/s}^2$ . In order to avoid sliding, he must bend with respect to the vertical plane by an angle

- (1)  $\theta = \tan^{-1}(4)$   
(2)  $\theta = 45^\circ$   
(3)  $\theta = \tan^{-1}(2)$   
(4)  $\theta = \tan^{-1}(3)$

39. An unbanked curved road has a radius of 60 m. The maximum safe speed at which a car can make a turn if the coefficient of static friction is 0.75 is nearly

- (1) 7 m/s (2) 14 m/s  
(3) 21 m/s (4) 28 m/s

40. A block of mass 6 kg lying on a rough surface with coefficient of static friction ( $\mu_s = 0.2$ ) is being exerted by a horizontal force of 5 N as shown. The frictional force acting the body is (Take  $g = 10 \text{ ms}^{-2}$ )



- (1) 5 N (2) 7 N  
(3) 9 N (4) 12 N

41. Mark the incorrect statements about the friction between two bodies.

- (1) Limiting friction is never less than static friction  
(2) Limiting friction is greater than the kinetic friction  
(3) Static friction is always greater than the kinetic friction  
(4) Coefficient of static friction is greater than the coefficient of kinetic friction

42. A car of mass  $m$  is moving on a circular path of radius  $r$ . At some instant, its velocity is  $v$  and the rate of increase of speed is  $a$ . The resultant force on the car will be

(1)  $m\sqrt{\frac{v^2}{a^2} + r^2}$  (2)  $m\sqrt{\frac{v^2}{r} + a}$   
 (3)  $m\sqrt{\frac{v^4}{r^2} + a^2}$  (4)  $m\sqrt{\frac{v^2}{r} + a^2}$

43. A rod of length  $L$  pivoted at one end is rotated with a uniform angular velocity in a horizontal plane. Let  $T_1$  and  $T_2$  be the tensions at the points  $\frac{L}{4}$  and  $\frac{3L}{4}$  away from the pivoted end respectively, then

(1)  $T_1 = T_2$  (2)  $T_1 > T_2$   
 (3)  $T_1 < T_2$  (4)  $T_1 = T_2 = 0$

44. A coin placed on a rotating turntable just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of turntable is doubled, it will just slip at a distance of

(1) 1 cm (2) 2 cm  
 (3) 3 cm (4) 4 cm

45. A stone of mass  $m$  is tied to a string and is moved in a vertical circle of radius  $r$  having speed  $v$  at the lowest point. The tension in the string when the stone is at the lowest point is

(1)  $mg$  (2)  $m(g + v^2/r)$   
 (3)  $m(g + vr)$  (4)  $m\left(g + \frac{v^2}{r}\right)$

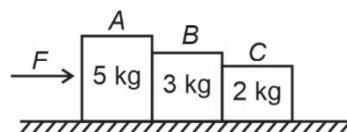
46. A particle is projected from ground such that maximum height gained by it is equal to half of the horizontal range acquired. Angle of projection of particle from horizontal is

(1)  $\tan^{-1}(4)$  (2)  $\tan^{-1}(3)$   
 (3)  $\tan^{-1}(2)$  (4)  $\tan^{-1}(\sqrt{2})$

47. For a particle  $x, y$  coordinates varies with time as  $x = 3t - 6t^2$  and  $y = 4t$ . Initial speed of particle is ( $x$  and  $y$  are in metre and time  $t$  is in second)

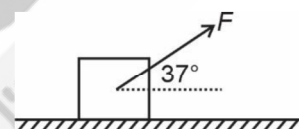
(1) 26 m/s (2)  $\sqrt{192}$   
 (3) 18 m/s (4)  $\sqrt{25}$  m/s

48. A force  $F = 100$  N is acting on three blocks placed in contact with each other as shown in the figure. Acceleration block B, will be



(1) 8 m/s<sup>2</sup> (2) 10 m/s<sup>2</sup>  
 (3) 7 m/s<sup>2</sup> (4) 13 m/s<sup>2</sup>

49. A block of mass 10 kg is placed on a rough horizontal surface and a force  $F = 50$  N is acting over it. If the block is not moving then force of friction acting over the block will be



(1) 30 N (2) 40 N  
 (3) 50 N (4) Zero

50. An unbanked curve has a radius of 100 m. The maximum speed at which a car can make a turn, if the coefficient of static friction is 0.5 will be nearly ( $g = 10$  m/s<sup>2</sup>)

(1) 36 m/s (2) 17 km/h  
 (3) 54 km/h (4) 22.4 m/s

## CHEMISTRY

### SECTION-A

51. The sum of the number of neutron(s) and proton(s) in deuterium (an isotope of hydrogen) is
- (1) 2  
 (2) 1  
 (3) 3  
 (4) 4

52. Charge to mass ratio for neutron is

(1) Zero (2)  $1.75 \times 10^{11}$  C kg<sup>-1</sup>  
 (3)  $9.58 \times 10^7$  C kg<sup>-1</sup> (4) 100 C kg<sup>-1</sup>

53. Electromagnetic radiation of maximum wavelength in the following is

(1) X-rays (2)  $\gamma$ -rays  
 (3) Microwaves (4) Radio waves

54. In photoelectric effect, threshold energy is equal to  
 (1) KE of ejected electron  
 (2) Energy of striking photon  
 (3) Energy of striking photon – KE of ejected electron  
 (4) Energy of striking photon + KE of ejected electron
55. Series of hydrogen spectrum which lies in ultraviolet region is  
 (1) Lyman (2) Balmer  
 (3) Paschen (4) Pfund
56. Correct variation of velocity of an electron in  $n^{\text{th}}$  Bohr orbit of H-atom is  
 (1)  $v \propto n$  (2)  $v \propto \frac{1}{n}$   
 (3)  $v \propto n^2$  (4)  $v \propto \frac{1}{n^2}$
57. Energy of an electron (in eV/atom) of  $4^{\text{th}}$  Bohr orbit of  $\text{He}^+$  ion is  
 (1) –13.6 (2) –27.2  
 (3) –3.4 (4) –6.8
58. If for a microscopic particle  $\Delta x = 4\Delta p$ , then uncertainty in its linear momentum is  
 (1)  $\frac{1}{2}\sqrt{\frac{h}{\pi}}$  (2)  $\frac{1}{4}\sqrt{\frac{h}{2\pi}}$   
 (3)  $\frac{1}{4}\sqrt{\frac{h}{\pi}}$  (4)  $4\sqrt{\frac{h}{\pi}}$
59. In which of the following orbital diagram, only Hund's rule of maximum multiplicity is violated?  
 (1)  $\begin{array}{cc} 2s & 2p \\ \boxed{\uparrow} & \boxed{\uparrow\uparrow\uparrow} \end{array}$  (2)  $\begin{array}{cc} 2s & 2p \\ \boxed{\uparrow\downarrow} & \boxed{\uparrow\uparrow\uparrow} \end{array}$   
 (3)  $\begin{array}{cc} 2s & 2p \\ \boxed{\uparrow\downarrow} & \boxed{\uparrow\uparrow\uparrow} \end{array}$  (4)  $\begin{array}{cc} 2s & 2p \\ \boxed{\uparrow} & \boxed{\uparrow\uparrow\uparrow} \end{array}$
60. Number of subshells in N shell is  
 (1) 1 (2) 4  
 (3) 9 (4) 16
61. If each orbital can have only one electron then maximum number of electrons that can be filled in a f-subshell is  
 (1) 3 (2) 6  
 (3) 12 (4) 7
62. Orbital in which electron density is symmetrically distributed in all direction is  
 (1) 1s (2)  $2p_x$   
 (3)  $3p_y$  (4)  $4d_{xy}$
63. Number of electrons in nitrogen atom for which azimuthal quantum number ( $l$ ) is 1, is  
 (1) 7 (2) 3  
 (3) 4 (4) 6
64. For which of the following orbitals, the number of radial nodes is maximum?  
 (1) 1s (2) 3p  
 (3) 3s (4) 5p
65. Correct electronic configuration of Cr (Atomic no. is 24) in ground state is  
 (1)  $[\text{Ar}] 3d^5 4s^1$   
 (2)  $[\text{Ar}] 3d^4 4s^0$   
 (3)  $[\text{Ar}] 3d^4 4s^2$   
 (4)  $[\text{Ar}] 3d^6$
66. Total number of exchanges possible for  $d^4$  configuration is  
 (1) 2 (2) 4  
 (3) 6 (4) 8
67. Pair of isotonic species is  
 (1)  $^{18}\text{Ar}^{40}$  and  $^{20}\text{Ca}^{40}$  (2)  $^7\text{N}^{14}$  and  $^6\text{C}^{13}$   
 (3)  $^7\text{N}^{15}$  and  $^8\text{O}^{15}$  (4)  $^7\text{N}^{15}$  and  $^9\text{F}^{19}$
68. Number of spectral lines of Lyman series obtained in  $\text{He}^+$  ion sample when electrons de-excited from  $4^{\text{th}}$  excited state is  
 (1) 10 (2) 4  
 (3) 5 (4) 8
69. Maximum number of unpaired electrons are present in  
 (1) Mn (2) F  
 (3) N (4) Cu
70. Orbital angular momentum (in BM) of 2p orbital is  
 $\left( \hbar = \frac{h}{2\pi} \right)$   
 (1) 0 (2)  $\sqrt{2} \hbar$   
 (3)  $\sqrt{6} \hbar$  (4)  $\sqrt{12} \hbar$

71. de Broglie wavelength of a particle is correctly related with its linear momentum is
- (1)  $\lambda = \frac{h}{p}$  (2)  $\lambda = \frac{h}{\sqrt{p}}$
- (3)  $\lambda = \left(\frac{h^2}{p}\right)$  (4)  $\lambda = \frac{h}{p^3}$
72. If radii of 3<sup>rd</sup> orbit of He<sup>+</sup> ion is  $x \text{ \AA}$  then the radii (in  $\text{\AA}$ ) of same orbit of Li<sup>2+</sup> ion will be
- (1)  $x$  (2)  $\frac{x}{2}$
- (3)  $\frac{3x}{2}$  (4)  $\frac{2x}{3}$
73. Bohr theory is not applicable for
- (1) H (2) He<sup>+</sup>
- (3) Li<sup>2+</sup> (4) Na<sup>+</sup>
74. Among the following, representative element is
- (1) Ni (2) Fe
- (3) Na (4) Co
75. Symbol of element with atomic number 106 is
- (1) Unn (2) Unb
- (3) Unh (4) Uns
76. Three-dimensional shape of the orbital is given by
- (1) Principal quantum number
- (2) Azimuthal quantum number
- (3) Magnetic orbital quantum number
- (4) Spin quantum number
77. Correct order of energy of orbital for hydrogen atom is
- (1)  $3d > 4p > 4s > 3p > 3s > 2p$
- (2)  $4p > 3d > 4s > 3p > 3s > 2p$
- (3)  $4p > 4s > 3d > 3p > 3s > 2p$
- (4)  $4p = 4s > 3d = 3p = 3s > 2p$
78. Correct general electronic configuration of  $f$ -block elements is
- (1)  $(n-1)d^{0-1} ns^2 (n+1)f^{1-14}$
- (2)  $(n-2)f^{1-14} (n-1)d^{0-1} ns^2$
- (3)  $(n-2)f^{1-14} (n-1)d^{0-1} ns^2$
- (4)  $(n-2)f^{1-14} (n-1)d^{1-10} ns^2$
79. If the successive ionization enthalpies of a metal (M) are  $x, 3x, 30x \text{ kJ mol}^{-1}$  respectively then the formula of metal halide will be
- (1) MX (2) MX<sub>3</sub>
- (3) MX<sub>4</sub> (4) MX<sub>2</sub>
80. Select the correct order of ionic size
- (1)  $\text{Ca}^{2+} > \text{K}^+ > \text{Cl}^- > \text{S}^{2-}$
- (2)  $\text{S}^{2-} > \text{Cl}^- > \text{K}^+ > \text{Ca}^{2+}$
- (3)  $\text{S}^{2-} > \text{Cl}^- > \text{Ca}^{2+} > \text{K}^+$
- (4)  $\text{Cl}^- > \text{S}^{2-} > \text{K}^+ > \text{Ca}^{2+}$
81. Atom of highest first ionization energy is
- (1) O (2) Ne
- (3) Be (4) N
82. Element having positive electron gain enthalpy is
- (1) O (2) F
- (3) Br (4) He
83. Among the following, lowest electronegativity is of
- (1) Na (2) Li
- (3) Be (4) Mg
84. Property which generally increases as we move from top to bottom in a group in periodic table is
- (1) Electronegativity
- (2) Atomic radius
- (3) Non-metallic behaviour
- (4) Ionization enthalpy
85. Oxide which is not basic in nature, is
- (1) Li<sub>2</sub>O (2) Na<sub>2</sub>O
- (3) K<sub>2</sub>O (4) CO<sub>2</sub>

## SECTION-B

86. Pair of elements which do not have diagonal relationship is
- (1) Li, Mg (2) Be, Al
- (3) B, Si (4) Na, Ca
87. Correct order of negative electron gain enthalpy is
- (1)  $\text{S} > \text{O} > \text{Se} > \text{Te}$
- (2)  $\text{O} > \text{S} > \text{Se} > \text{Te}$
- (3)  $\text{S} > \text{Se} > \text{Te} > \text{O}$
- (4)  $\text{S} > \text{Se} > \text{O} > \text{Te}$

88. If energy required for the ionization of 0.2 g atom of Na is  $x$  kJ then the amount of energy required (in kJ) to ionize 2.3 g of Na atom is
- (1)  $x$  (2)  $\frac{x}{2}$   
 (3)  $\frac{x}{3}$  (4)  $2x$
89. Among the following, electronic configuration of most electronegative element is
- (1)  $1s^1$  (2)  $1s^2 2s^2 2p^6 3s^2$   
 (3)  $1s^2 2s^2 2p^6 3s^2 3p^4$  (4)  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$
90. Among  $s$ ,  $p$ ,  $d$  and  $f$  orbitals, shielding effect is highest for
- (1)  $s$ -orbital (2)  $p$ -orbital  
 (3)  $d$ -orbital (4)  $f$ -orbital
91. Which of the following set of atomic numbers represents only transition elements?
- (1) 19, 23, 47 (2) 21, 28, 48  
 (3) 47, 72, 79 (4) 30, 48, 80
92. What is the value of electron gain enthalpy of  $K^+$  if  $IE_1$  of K is 4.3 eV?
- (1) +4.3 eV (2) +8.6 eV  
 (3) -4.3 eV (4) -8.6 eV
93. The longest wavelength of Paschen series of  $Li^{2+}$  ion is
- (1)  $\frac{36}{R}$  (2)  $\frac{16}{7R}$   
 (3)  $\frac{7R}{16}$  (4)  $\frac{4}{3R}$
94. Difference in radius between 4<sup>th</sup> and 6<sup>th</sup> Bohr orbit of H-atom is
- (1) 10.58 Å (2) 1.058 Å  
 (3) 5.29 Å (4) 52.9 Å
95. Maximum number of electrons that can be accommodated by  $d$ -orbital is
- (1) 2 electrons (2) 5 electrons  
 (3) 10 electrons (4) 8 electrons
96. IUPAC official name of element whose atomic number is 102 is
- (1) Mendelevium (2) Nobelium  
 (3) Lawrencium (4) Dubnium
97. Correct order of IE of the following elements is
- (1)  $F > O > N > C > B$  (2)  $N > F > O > C > B$   
 (3)  $F > N > O > C > B$  (4)  $B > C > N > O > F$
98. A golf ball has a mass of 40 g and a speed of 45 m/s. If the speed can be measured within accuracy of 2%, then the uncertainty in the position will be
- (1)  $1.46 \times 10^{-33}$  m (2)  $1.46 \times 10^{-31}$  m  
 (3)  $2.82 \times 10^{-30}$  m (4)  $3.9 \times 10^{-34}$  m
99. The wavenumber of an electromagnetic radiation having wavelength 4000 Å is
- (1)  $2 \times 10^6 \text{ cm}^{-1}$  (2)  $2.5 \times 10^5 \text{ cm}^{-1}$   
 (3)  $5 \times 10^4 \text{ cm}^{-1}$  (4)  $2.5 \times 10^4 \text{ cm}^{-1}$
100. Which among the following is a metalloid?
- (1) Na (2) Ge  
 (3) Bi (4) Br

## BOTANY

### SECTION-A

101. Which of the following is a defining feature of all living organisms?
- (1) Growth (2) Self-consciousness  
 (3) Reproduction (4) Metabolism
102. The lowest category that is shared by both potato and wheat is
- (1) Class (2) Family  
 (3) Division (4) Order
103. Select the **correct** option w.r.t. botanical gardens
- (1) Are quick source of reference  
 (2) Are analytical in nature  
 (3) Are 'ex-situ' conservation strategies  
 (4) Conserve plants and animals both
104. Taxonomy includes all, **except**
- (1) Classification (2) Nomenclature  
 (3) Identification (4) Phylogeny

105. Select the **incorrect** statement w.r.t. binomial nomenclature.
- (1) The scientific name is printed in italics
  - (2) Both words of a scientific name are underlined separately when handwritten
  - (3) Each organism has one name consisting of two words
  - (4) Binomial epithet has generic and specific names only
106. In which of the following reproduction is synonymous with growth?
- (1) *Amoeba*
  - (2) *Hydra*
  - (3) *Planaria*
  - (4) Higher plants
107. The immediate next lower category to kingdom in taxonomic hierarchy for plants is
- (1) Phylum
  - (2) Division
  - (3) Class
  - (4) Order
108. The **correctly** written scientific name of brinjal is
- (1) *Solanum Tuberosum*
  - (2) *Solanum tuberosum*
  - (3) *Solanum nigrum*
  - (4) *Solanum melongena*
109. Semi-autonomous double membrane bound cell organelles duplicate during which of the following phase?
- (1) G<sub>1</sub> phase
  - (2) S phase
  - (3) G<sub>2</sub> phase
  - (4) M phase
110. In which of the following cells, centrioles duplicate during S-phase?
- (1) Plant cells
  - (2) Animal cells
  - (3) Bacterial cells
  - (4) Cyanobacterial cells
111. Enzyme recombinase, responsible for recombination of genetic material is required during
- (1) Zygotene
  - (2) Diplotene
  - (3) Pachytene
  - (4) Diakinesis
112. Most of the proteins are synthesized in G<sub>1</sub> phase but histones are synthesized in the phase in which
- (1) Tubulin protein synthesis occurs
  - (2) DNA synthesis occurs
  - (3) Chloroplast duplication occurs in plant cells
  - (4) Division of cytoplasm occurs
113. How many total number of mitotic divisions takes place to form 16 cells from a single cell?
- (1) 15
  - (2) 4
  - (3) 8
  - (4) 2
114. Find the **correct** option for A and B respectively.  
Phylum → A → B → family
- (1) Genus and order
  - (2) Class and order
  - (3) Order and class
  - (4) Sub-family and class
115. Dogs are placed in the family
- (1) Felidae
  - (2) Canidae
  - (3) Muscidae
  - (4) Hominidae
116. Choose the **odd** one w.r.t. *Musca domestica*
- (1) It is scientific name for housefly
  - (2) *Musca* represents generic name
  - (3) This species is kept in order Insecta
  - (4) *domestica* is specific epithet
117. How many total different genera are there in the scientific names of organisms?  
Brinjal, tiger, lion, makoi and leopard.
- (1) Three
  - (2) Two
  - (3) Four
  - (4) Five
118. Rules of scientific naming of brinjal is assigned in
- (1) ICZN
  - (2) ICNB
  - (3) ICBN
  - (4) ICVCN
119. The word systematics is derived from a \_\_\_\_\_ word 'systema'.
- (1) Greek
  - (2) English
  - (3) Roman
  - (4) Latin
120. Which of the following is the basic and the lowest category of taxonomic hierarchy?
- (1) Species
  - (2) Genus
  - (3) Division
  - (4) Family
121. Gap phase 1 of interphase does **not** involve synthesis of
- (1) Nucleotides
  - (2) Amino acids
  - (3) Any nucleic acid
  - (4) DNA

122. Read the following statements and choose the **correct** option.  
**Statement A** : Crossing over is completed in anaphase I.  
**Statement B** : Interkinesis and interphase are similar to each other in terms of replication of DNA.  
 (1) Only A is correct  
 (2) Only B is correct  
 (3) Both A and B are correct  
 (4) Both A and B are incorrect
123. Select the **correct** option w.r.t. the daughter cells produced after meiosis I  
 (1) Are genetically similar to each other  
 (2) Are genetically similar to parent cell  
 (3) Are genetically dissimilar to each other  
 (4) Have same ploidy level as that of parent cell
124. What will be the number of chromatids in prophase I of a cell having 10 bivalents?  
 (1) 20 (2) 40  
 (3) 80 (4) 60
125. Cytokinesis in plant cells differs from animal cells as the former involves  
 (1) Furrow formation  
 (2) Centripetal cell plate formation  
 (3) Constriction of plasma membrane towards the center  
 (4) Centrifugal growth of phragmoplast
126. Crossing over takes place between  
 (1) Sister chromatids of a chromosome  
 (2) Non-sister chromatids of homologous chromosomes  
 (3) Sister chromatids of non-homologous chromosomes  
 (4) Non-sister chromatids of non-homologous chromosomes
127. Select the **correct** option w.r.t. the most active stage of cell cycle  
 (1) Involves division of parent cell into daughter cells  
 (2) Is metabolically inactive  
 (3) Is called the resting phase  
 (4) Constitutes only 5% duration of the total cell cycle
128. Condensation of chromatin material begins in  
 (1) Anaphase I (2) Prophase  
 (3) Metaphase I (4) Telophase
129. Spindle fibres get attached to a disc shaped structure called kinetochore in  
 (1) Pachytene (2) Zygotene  
 (3) Metaphase (4) Telophase II
130. Pairing of homologous chromosomes called synapsis takes place in which phase of prophase I?  
 (1) Zygotene (2) Diplotene  
 (3) Pachytene (4) Leptotene
131. The total number of meiotic divisions required to produce 800 pollen grains in wheat is  
 (1) 250 (2) 200  
 (3) 800 (4) 1200
132. The centromere splits during which of the following phase?  
 (1) Metaphase I (2) Anaphase I  
 (3) Metaphase II (4) Anaphase II
133. Which of the following is the best stage to study the shape of the chromosomes?  
 (1) Anaphase (2) Metaphase  
 (3) Prophase (4) Telophase
134. If there are 20 chromosomes and 10 pg of DNA in G<sub>1</sub> phase of a diploid cell, then the amount of DNA and number of chromosomes respectively in the product of meiosis I are  
 (1) 10 and 10 (2) 10 and 20  
 (3) 20 and 10 (4) 20 and 20
135. Terminalisation of chiasmata is seen during which phase of cell cycle?  
 (1) Metaphase I  
 (2) Diakinesis of prophase I  
 (3) Diplotene of prophase I  
 (4) Anaphase I

#### SECTION-B

136. In taxonomic hierarchy how many obligate categories are there?  
 (1) Six (2) Four  
 (3) Seven (4) Five

137. Plant family Liliaceae includes genera  
 (1) *Datura*, *Petunia*  
 (2) *Allium*, *Datura*  
 (3) *Allium*, *Colchicum*  
 (4) *Colchicum* and *Datura*
138. All of the following are orders, **except**  
 (1) Rodentia (2) Primata  
 (3) Carnivora (4) Mammalia
139. Indian Botanical Garden is located in  
 (1) Howrah (2) Darjeeling  
 (3) Lucknow (4) New Delhi
140. Which of the following taxonomical aid contains information of any one taxon?  
 (1) Flora (2) Monograph  
 (3) Catalogue (4) Manual
141. Which of the following is significance of meiosis?  
 (1) Growth  
 (2) Repair  
 (3) Restores nucleocytoplasmic ratio  
 (4) Increases genetic variability
142. Select the **odd** one w.r.t. significance of mitosis.  
 (1) Growth of multicellular organisms  
 (2) Maintenance of cell size  
 (3) Maintenance of chromosome number  
 (4) Introduction of variation
143. Reappearance of nucleolus and nuclear membrane occurs in which of the following phase?  
 (1) Telophase (2) Prophase  
 (3) Anaphase (4) Metaphase
144. The bivalent chromosomes align themselves on the equatorial plate.  
 Above statement is **true** for  
 (1) Metaphase II  
 (2) Metaphase I  
 (3) Metaphase of mitosis  
 (4) Anaphase I
145. Synaptonemal complex is formed to accompany synapsis of homologous chromosomes. This complex is formed during  
 (1) Pachytene (2) Zygotene  
 (3) Leptotene (4) Diakinesis
146. Which of the following phase of cell cycle lasts more than 95% duration of cell cycle?  
 (1) M-phase (2) Interphase  
 (3) Cytokinesis (4) Quiescent stage
147. The non-dividing cell enters which of the following stages of cell cycle?  
 (1) G<sub>0</sub> stage (2) G<sub>1</sub> phase  
 (3) S phase (4) G<sub>2</sub> phase
148. Which of the following phases is the end stage of karyokinesis?  
 (1) Prophase (2) Anaphase  
 (3) Metaphase (4) Telophase
149. The branch of science which deals with the study of principles and procedures of classification is known as  
 (1) Systematics (2) Taxonomy  
 (3) Biodiversity (4) Nomenclature
150. Binomial nomenclature for scientific naming at organisms was developed  
 (1) Carolus Linnaeus (2) Aristotle  
 (3) R.H. Whittaker (4) Walther Flemming

## ZOOLOGY

### SECTION-A

151. Coenzyme nicotinamide adenine dinucleotide (NAD) and NADP contain the vitamin  
 (1) Thiamine  
 (2) Niacin  
 (3) Pyridoxine  
 (4) Tocopherol
152. An enzyme which would catalyse the following reaction will belong to which class according to IUB?
- $$\begin{array}{c} \text{X} \quad \text{Y} \\ | \quad | \\ \text{C} - \text{C} \end{array} \longrightarrow \text{X} - \text{Y} + \text{C} = \text{C}$$
- (1) Isomerases (2) Ligases  
 (3) Lyases (4) Transferases

153. Succinate dehydrogenase is inhibited by which substance closely resembling succinate in structure?
- (1) Fumarate (2) Malonate  
(3) Glucose (4) Acetate
154. The element which acts as a cofactor for the proteolytic enzyme carboxypeptidase is
- (1) Magnesium (2) Zinc  
(3) Molybdenum (4) Iron
155. The protein which enables glucose transport into cells is
- (1) Trypsin (2) Pepsin  
(3) Collagen (4) GLUT-4
156. The most abundant chemical compound in living organisms is
- (1) Proteins (2) Nucleic acid  
(3) Water (4) Carbohydrates
157. A secondary metabolite which can also be used as a drug is
- (1) Monoterpene (2) Diterpene  
(3) Vinblastin (4) Carotenoid
158. All the molecules in the acid insoluble fraction are polymeric substances with the exception of
- (1) Proteins (2) Nucleic acids  
(3) Polysaccharides (4) Lipids
159. All of the following are linear chains of amino acids linked by peptide bonds **except**
- (1) Antibodies (2) Insulin  
(3) Receptors (4) Cellulose
160. Inulin is a polymer of
- (1) Glucose (2) Fructose  
(3) Galactose (4) Lactose
161. The sequence of amino acids *i.e.* the positional information in a protein is represented by its
- (1) Primary structure  
(2) Secondary structure  
(3) Tertiary structure  
(4) Quaternary structure
162. As living organisms work continuously, the living state is a
- (1) Equilibrium non-steady state  
(2) Equilibrium steady state  
(3) Non-equilibrium steady state  
(4) Non-equilibrium non-steady state
163. Which bond is **not** formed by dehydration?
- (1) Peptide bond  
(2) Glycosidic bond  
(3) Disulfide bond  
(4) Phosphodiester bond
164. The most important form of energy currency in living systems is the bond energy in a chemical called
- (1) DNA (2) RNA  
(3) ATP (4) GMP
165. The blood concentration of glucose in a normal healthy individual is
- (1) 4.2 – 6.1 mM (2) 45 – 80 mM  
(3) 7.5 – 9.5 mM (4) 75 – 95 mM
166. **Statement A** : Dissolving of CO<sub>2</sub> in water which is a physical process is a catalysed reaction in the living system.  
**Statement B** : There are no uncatalysed metabolic conversions in the living system.
- (1) Statement A is true but B is false  
(2) Statement B is true but A is false  
(3) Both statements are true  
(4) Both statements are false
167. Biocatalysts which hasten the rate of metabolic conversions are mostly
- (1) Polysaccharides (2) Proteins  
(3) Lipids (4) Monosaccharides
168. Enzymes isolated from most thermophilic organisms such as *Taq* polymerase retain their catalytic power even at high temperatures upto
- (1) 80° – 90°C (2) 800° – 900°C  
(3) 8000° – 9000°C (4) 10000°C
169. When the backbone of a protein enzyme chain folds upon itself, the chain criss crosses itself and forms crevice or pockets for substrate attachment called
- (1) Inactive site (2) Inert site  
(3) Active site (4) Passive site

170. In a DNA molecule, guanine compulsorily base pairs with

- (1) Adenine (2) Thymine  
(3) Cytosine (4) Uracil

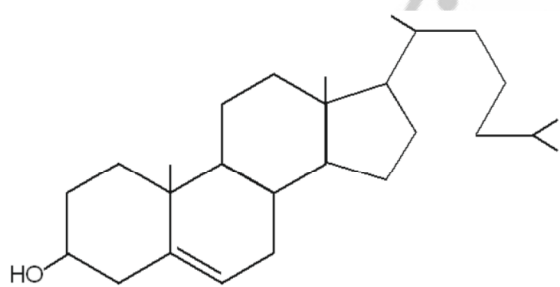
171. Amino acids are linked to each other to form proteins via

- (1) Glycosidic bonds  
(2) Peptide bonds  
(3) Phosphodiester bonds  
(4) Anhydride bonds

172. The adult haemoglobin consists of 4 subunits in which each of the two subunits are the type of

- (1)  $\alpha$  and  $\gamma$  (2)  $\beta$  and  $\delta$   
(3)  $\alpha$  and  $\beta$  (4)  $\gamma$  and  $\delta$

173. The diagrammatic representation of which organic compound in living tissues is depicted in the structure given below?



- (1) Gingelly oil (2) Cholesterol  
(3) Lemon grass oil (4) Collagen

174. Lecithin is an example of a

- (1) Nitrogenous base (2) Glycoprotein  
(3) Phospholipid (4) Polysaccharide

175. The chemical formula of ribose sugar is

- (1)  $C_6H_{12}O_6$  (2)  $C_5H_{10}O_4$   
(3)  $C_5H_{10}O_5$  (4)  $C_{12}H_{24}O_{12}$

176. A fatty acid which has 20 carbon atoms including the carboxyl carbon is

- (1) Palmitic acid (2) Arachidonic acid  
(3) Oleic acid (4) Stearic acid

177. All of the following are nucleosides **except**

- (1) Adenosine (2) Guanosine  
(3) Cytosine (4) Thymidine

178. Which of the following is **not** an aromatic amino acid?

- (1) Tyrosine (2) Phenylalanine  
(3) Tryptophan (4) Alanine

179. Glucose can be ultimately metabolised aerobically or anaerobically along similar metabolic pathways to form any of the following end products **except**

- (1) Ethanol (2) Pyruvic acid  
(3) Lactic acid (4) Glutamic acid

180. A secondary metabolite which is a naturally occurring toxin is

- (1) Curcumin (2) Codeine  
(3) Ricin (4) Morphine

181. Choose the **incorrect** statement w.r.t. enzyme activity.

- (1) Enzymes generally function in a narrow range of temperature and pH  
(2) Low temperature preserves enzymes in a temporarily inactive state  
(3) Activity of enzymes increases both below and above optimum value  
(4) Usually high temperature above  $60^\circ\text{C}$  destroys enzymatic activity

182. Factors which affect enzyme activity include all **except**

- (1) Substrate concentration  
(2) Temperature  
(3) pH  
(4) Nature of product

183. Zymogens are

- (1) Enzymes secreted in active state  
(2) Enzymes secreted in inactive state  
(3) Competitive inhibitors of enzymes  
(4) Non-competitive inhibitors of enzymes

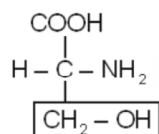
184. All of the following may be identified as co-factors **except**

- (1) Prosthetic groups  
(2) Co-enzymes  
(3) Apoenzyme  
(4) Metal ions

185. Removal of the co-factor from an enzyme will result in
- (1) Increase of catalytic activity
  - (2) Initial decrease of catalytic activity followed by increase
  - (3) Loss of catalytic activity
  - (4) No effect on catalytic activity

### SECTION-B

186. The amino acid represented by the structure given below is



- (1) Glycine                      (2) Alanine
  - (3) Serine                      (4) Valine
187. Glycerol is also known as
- (1) Monohydroxy propane
  - (2) Dihydroxy propane
  - (3) Trihydroxy propane
  - (4) Tetrahydroxy propane
188. Which of the following is a primary metabolite?
- (1) Carotenoids                      (2) Anthocyanins
  - (3) Amino acids                      (4) Rubber
189. Exoskeleton of insects are made of a complex polysaccharide called
- (1) Inulin                      (2) Chitin
  - (3) Starch                      (4) Cellulose
190. The pentose sugar present in DNA is
- (1) Ribose                      (2) Fructose
  - (3) Deoxyribose                      (4) Galactose
191. The nitrogen base which is characterised as a substituted purine is
- (1) Uracil                      (2) Cytosine
  - (3) Thymine                      (4) Adenine
192. The first amino acid in a protein chain is known as
- (1) N-terminal                      (2) C-terminal
  - (3) M-terminal                      (4) D-terminal

193. The helices observed in proteins are
- (1) Only left handed
  - (2) Right handed
  - (3) Stabilised by glycosidic bonds
  - (4) Stabilised by disulfide bonds
194. The most abundant protein in the whole of the biosphere is
- (1) Collagen                      (2) RuBisCO
  - (3) Globulin                      (4) Albumin
195. Glucosamine and N-acetyl glucosamine are chemically modified
- (1) Nucleosides                      (2) Sugars
  - (3) Lipids                      (4) Nucleotides
196. Select the **incorrect** match among following

	Element % weight of	Earth's crust	Human body
(1)	Oxygen	46.6	65.0
(2)	Sodium	2.8	0.2
(3)	Magnesium	0.1	2.1
(4)	Calcium	3.6	1.5

197. If total number of nucleotides in a DNA double helix are 1000.
- Out of which 240 are 'A' containing nucleotides. How many pyrimidine bases are present in DNA helix?
- (1) 260                      (2) 500
  - (3) 240                      (4) 200
198. Consider the following statements w.r.t. amino acids.
- a.  $\alpha$ -amino acids are substituted methanes
  - b. A zwitterion is compound that has a negative charge on one atom and another negative charge on adjacent atom.
  - c. In solutions of different pH, the structure of amino acids changes
  - d. Amino acids are found in acid insoluble fraction along with the lipids.
- Select the option with **correct** statements only.
- (1) a and b                      (2) a and c
  - (3) c and d                      (4) a and d

199. Read the given statements and select the option that correctly identifies them as true(T) or false(F).

- a. All enzymes are proteinaceous in nature.
- b. Enzymes bring down activation energy barrier making the transition of substrate to product more easy.
- c. Thermal stability is the quality of enzymes isolated from thermophilic organisms.
- d. Glycolysis is a 20 steps anabolic pathway.

	a	b	c	d
(1)	T	F	F	T
(2)	F	T	T	F
(3)	F	F	T	T
(4)	T	T	T	F

200. Read the following statements and choose correct option.

**Statement-A** : Prosthetic groups are organic compounds that are tightly bound to the apoenzyme.

**Statement-B** : Dietary proteins are the source of non-essential amino acids.

- (1) Both statements A and B are correct
- (2) Both statements A and B are incorrect
- (3) Only statement A is correct
- (4) Only statement B is correct

